IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TENNESSEE
AT KNOXVILLE, TENNESSEE

United States of America,	:	
	:	
Plaintiff,	:	
	:	
vs.	:	Case No. 3: 08-cr-143
	:	
Donald Ray Reynolds, Jr.,	:	**Testimony of**
and Nathaniel Smith, Jr.,	:	**Dr. Hacene Boudries**
	:	
Defendants.	:	

Transcript of proceedings before the Honorable Dennis H. Inman, U. S. Magistrate Judge, on **May 13th, 2009.**

Appearances:

On behalf of the Plaintiff:

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I N D E X

(Following is the testimony of Dr. Hacene Boudries, Plaintiff's witness from the Daubert hearing of 5-13-09:)

By Ms. Plowell:

Q. Good morning, Dr. Boudries. Please give your name and your occupation for the Court.

A. My name is Hacene Boudries. I am R&D manager at GE Security. I am responsible for ion mobility spectrometry and detection at GE Security.

Q. And R&D is research and development?

A. Yes, R& D is research and development, yes.

Q. How long have you been so employed?

A. Four years–

MR. ELDRIDGE: If I might interrupt, I'm having a hard time hearing.

THE WITNESS: Okay. Can you hear me now?

MR. ELDRIDGE: That's wonderful. Thank you.

A. Yes. For four years. I started in 2005.

Q. And what did you do prior to that?

A. Prior that I was working at MIT as a research scientist and also Aerodyne Research–

(Court reporter asked witness to repeat.)

A. –research scientist, and also Aerodyne, Aerodyne as a senior scientist.

THE COURT: And your doctorate is in what?

THE WITNESS: Analytical chemistry.

Q. I was just going to ask you to give your full educational background for the Court, if you would.

A. Yes. I did my Master and Ph.D. in analytical chemistry at University of Paris VII in France.

THE COURT: University of?

THE WITNESS: Paris Seven, that's the name of the university.

A. (Continuing) So I got my Ph.D. there in atmospheric chemistry, mainly focusing on analytic techniques such as gas chromatography, mass spectrometry. After that I was appointed as professor assistant, and I was teaching all kind of chemistry courses for almost two years.

And then after that I decided to do a post-doc, post doctorate, in Canada, so I went to Canada. I spent almost three years and a half at Atmospheric Environment Service in Canada, also doing research using different kind of analytical techniques, such as GC, which is gas chromatography, mass spectrometry, for the detections of hydrocarbons in the air.

Q. Can you tell the Court what a hydrocarbon is, please?

A. Hydrocarbons is basically organic molecules that has numbers of carbons, hydrogens, sometimes oxygens. So it could be benzene, toluene, methanol, ethanol, almost everything that a car is emitting in the air, aircraft engine, trucks, things like that.

So we'll try to characterize all that emission using different kinds of analytical tools such as GC and GCMS.

Q. Now, have you published any articles?

A. Yeah. I have published many articles when I was a research scientist. Also when I joined Aerodyne and MIT, I published a lot in aerosol science. Basically I was focusing on characterizing the chemical and physical composition of aerosols in the air.

Q. And have you written any articles on ion trap mobility spectrometry?

A. We have one that is going to be published very soon. Because we work for GE, sometimes it's extremely difficult to publish. GE does not like to publish the science so we can keep all the– basically secret also all the advance of our technique, not published.

But we have one paper that is going to be published very soon. We have a presentation. In fact, I was down just couple days ago at ITRAP-O.E.(phonetic) in Boston. And we sometimes gave presentations at the IMS conference, which is ion mobility spectrometry conference. There is one organized every year, and we try to every year at least present something there.

Q. Okay. Can you explain for the Court what is ion trap mobility spectrometry?

A. I think maybe if I can go through the slides, I have prepared some slides. I can go very quickly through that or I can just give you very quickly definition of ion mobility spectrometry, and then we can go into the detail, if you are interested.

Q. Why don't we start with just the first definition, then we'll go

through the slides in a minute?

A. Okay. So ion mobility spectrometry refers to a technique that measures the speed of molecules in a field, an electrical field. Basically, what we try to do is, you know your start position, you know your end position, you have the molecule and you try to measure how long it will take that molecule to fly from Point A to Point B. That's basically ion mobility spectrometry.

Q. Does the substance that you are testing differ, does it differ based on the size of the molecule?

A. Basically, they are separated based on the size of the molecule, yeah. The smallest one will arrive first to their target or to their detector and the heaviest one will arrive later on.

Q. Does every molecule travel at a different speed based on the substance?

A. Yes. If they have different size, they travel at different speeds.

Q. What is that called, the travel?

A. The time of flight, that's what we define. There is two definitions; we call it the time of flight or the drift time. Basically, that's what you will see on our instrument, is we display the drift time for the molecule. It means we look at if there is a signal at a certain position on a certain time, and then we correlate that time to a specific molecule.

This is why we do a calibration. So you calibrate your system with known molecules, and then you characterize your time of

flight for that specific molecules. And then if you take a sample and you see a signal at that specific time you can correlate that signal to a presence of that molecule.

THE COURT: Doctor, you need to wait on me.

THE WITNESS: Okay.

THE COURT: You're sure not dealing with a chemist here.

THE WITNESS: All right.

THE COURT: And please do not agree with me for the sake of agreeing with me.

THE WITNESS: Okay.

THE COURT: I'm saying this aloud to make sure I understand. If I misunderstand, you need to correct me; all right?

THE WITNESS: Yes, sir.

THE COURT: But this technique, the ion trap mobility spectrometry, is based on the fact that small molecules move more quickly than heavier molecules?

THE WITNESS: Yes. Yes, sir.

THE COURT: The device measures the speed of these molecules, whatever they may be?

THE WITNESS: Yes.

THE COURT: Thirdly, you calibrate the device with known or identified molecules?

THE WITNESS: Yes, sir.

THE COURT: You may be getting into this, but I just

need to know now. Every molecule, whatever it is, hydrogen, water, uranium, whatever, all are unique?

THE WITNESS: Yes.

THE COURT: Do any of them have rates of travel so fast– or, excuse me– so similar that you could confuse the two molecules?

THE WITNESS: Okay. There is a probability that some molecule will give you the same time of flight as the one you are trying to calibrate. So there is tens of millions of molecule in the air, basically, or molecules that someone can make. So does all of them have different time of flight? No. Maybe some of them have exactly the same time of flight or very close time of flight.

However, what we do in our technique, there is another thing that we add to our system we call a dopant chemistry.

THE COURT: What kind of chemistry?

THE WITNESS: Dopant. Dopant is just another chemical that is inserted in a device; it's ammonia or dichloromethane. What ammonia and dichloromethane do in our system is basically suppress everything that is not of our interest.

For instance, if you want to target narcotics or explosives, we have selected these two chemicals; that if you have, for instance, all your molecules, such as benzene, toluene, et cetera, all these molecules would be suppressed. So the only one we are going to see ionize and fly down into our drift tube are the ones of interest to us.

And after we do that, we go in the field and we take thousands of samples just to make sure, and exactly that's the point to your question, just to make sure that we don't have another sample that can trigger similar that we think it's related to a molecule of interest. That's what we call a false alarm.

That's what we do. When the device is calibrated and characterized, it's taken to a field where several thousands of sample are taken to make sure that there is nothing else is going to generate what we call false alarms. And we do that to minimize that false alarm below two per cent or even lower than that.

THE COURT: Okay. In this case, you have calibrated the device for cocaine and other illegal drugs?

THE WITNESS: Yes.

THE COURT: You have used the two, ammonia–

THE WITNESS: Ammonia and dichloromethane.

THE COURT: –dichloromethane to suppress any other molecule that has a speed similar to that of a cocaine molecule?

THE WITNESS: Yes.

THE COURT: And you have field-tested this how many occasions to ascertain that you're not getting any false positives?

THE WITNESS: Basically, we try to deliver product that has less than two per cent false alarm. So if you take, for instance, a hundred samples, you may have one or two samples that can give you a false alarm, you think it's– you are detecting something, but in reality it's just a false alarm.

So we try to design the device– there is other priorities that we have to take into account– to make sure that when you are in the field, when you take sample from any surfaces or in the air, you minimize your false alarms. And we try to get below two per cent, and we have done all our field test where we were even below point five per cent.

THE COURT: Below point five?

THE WITNESS: Yes, point five per cent.

By Ms. Plowell (continued):

Q. And just if you could explain for the judge, the false alarms, tell the judge, if you could, what does that include?

A. So the false alarms, there is the false positives and false negative. Just very quickly, what's the difference between the two, a false positive is, you have your sample of interest. For instance, you are trying to analyze TNT, and then you pass the trap into your device and then the device tells you there is nothing.

And a false negative is exactly the opposite; you don't have anything in your sample, and the instrument would tell you, oh, you have something. And thus we try to minimize these false positives and false negatives below a reasonable number, which is two per cent.

Q. So the two per cent error rate includes both false negative and false positives?

A. Yes, false positive. And sometimes it's– also it's called nuisance alarm.

Q. Explain to the Court what the nuisance alarm is.

A. Basically, is just to– word used to describe false alarm. Some calls it false alarm; I like to call it false alarm.

Q. Now, the product that is used for the ion scan, tell the Court what that is that you all use.

A. So can you repeat your own question?

Q. What's the name of the product that you use to do the ion scan?

A. We use ion trap mobility spectrometry. It stands for ion. Basically, we make ions, we trap them into a field, and then we put them into an electrical field and we observe the speed for these ions to fly from one positions to another. That's the ion trap mobility spectrometry.

Q. And what's GE's product for that?

A. So we have hand-held and desk tops and portal products. All of them–

(Court reporter asked witness to repeat.)

A. Hand-held, desk tops, and also portals, and all of them use the same detector, ion trap mobility spectrometry. The only difference is the sampling configurations. Every one has a different sampling configuration. But when the sample is introduced into the detector, after that, everything is the same. And all are basically right now configured for the detections of explosives and narcotics.

Q. Okay. And are you familiar with the Itemiser-3?

A. Yes, I am.

Q. And tell the Court what the Itemiser-3 is, please.

A. Itemiser-3 is a desk top device that's basically used to analyze substances that are present on a trap. Basically, the sample introduction consists of taking a trap– I think I have a picture; I can show it later on.

You swab your trap on some surfaces, and then you insert the trap into the device. After seven seconds of analysis time, you will get the results of what was in the trap.

Q. Okay. And is that the product that was used here in this case, the Itemiser-3?

A. Yes, it is.

Q. And we've got your PowerPoint presentation. Why don't we just start going through it to make it quite clear?

MS. PLOWELL: Judge, I've got a copy of the– a printed out copy, of the PowerPoint presentation that I'd like to introduce as evidence so that you may review it in the future.

(Plaintiff's Exhibit No. 1 received.)

Q. Okay. Tell the Court– we're looking at kind of four prongs here. And has the theory of, ion mobility theory, has that been tested?

A. Yes. I can go, in fact, through all of this question. This PowerPoint, this is basically the summary of the presentation of the IMS technology. At first has the theory or technique has been tested. If you go, please, to the next slide.

So the instrument, has the theory and technique been tested, so the answer is, the instrument evaluation acceptance/certification. Basically, our devices, when they are built, before we deploy them to the field, they have go through a very thorough certification process. So, basically, we give our devices to, for instance, TSA here in the United States, STAC. in France, ISA in Israel.

And then we give them the device, the manual, and they do their own protocol for evaluation of their system. Basically, they have their own criterias for sampling and detection and performance, and the device is certified only if it meets their criteria.

And as of now we have the Itemiser-2 that is certified, we have the Itemiser-3DX– it just passed the certification– we have the Itemiser-3 that is used in this case certified, ENAC, Italy, and we have the Itemiser-3DX that passed the lab certification in France and also Israel.

We also provide our devices to different agencies. They do try– or evaluations. So every agency sometimes have their own, I would say, their own conditions, how they want to run the device. They want to check and make sure that the instruments meet their requirements.

So we give them the device and they test it. That's basically they test the instrument that performs for the detections of narcotics and explosives and meet their criteria.

Q. And where is this technology typically used?

A. Basically, it is used by U.S. Army, by TSA, Coast Guard, Customs, laboratories, police, basically almost everyone who are trying to look for the presence of explosives as well as narcotics.

Q. Okay. Now, the science behind this or the physics behind it, is it similar to the gas chromatography that's used in labs to test for the presence of narcotics?

A. It's not very similar. The main difference is that ion mobility spectrometry is a very simple technique, so it can be– you can– it's basically a mass spectrometer that can operate at atmospheric pressure that will simplify the design. It can make the operation of the device very simple.

Also, it's a very small device. You can deploy sometimes in the field. That's the main difference. And also it can give you more or less the same response as GCMS. The only thing that we don't have compared to GCMS is the quantitative response.

In GCMS you can quantify what you have in your sample. In IMS right now, the results of the response is just yes or no; it detected or it didn't detect.

Q. And the GCMS is the gas mass spectrometry–

A. Yes. It's gas chromatography/mass spectrometry.

Q. Okay. Is that's what's used typically in, say, police laboratories and forensic laboratories?

A. I guess so. I'm not familiar with that, but yes.

Q. And the difference between the GC is that if you had a

substance that you were testing for the presence of cocaine, in the GCMS it can tell you this substance is 60 per cent cocaine, whereas the IMS simply tells you this substance is cocaine?

A. Yes.

MR. ELDRIDGE: Object to leading, your Honor.

THE COURT: Sustained. But it's inconsequential. The point is, that the ion device simply will not quantitate, correct?

THE WITNESS: Yes. Yes, your Honor.

Q. Okay. Now, tell me this. Are there any publications pertaining to this ion, ITMS or the IMS technology?

A. Yes. Can you please go to the next? Yeah, "Peer Review and Publication." There is a lot of paper that I've published using ion mobility spectrometry. There is also a lot of laboratories here in the United States and also in Europe working on ion mobility spectrometry. We have corroborations with some of the universities.

In fact, the paper we are publishing very recently was a joint paper with the University of– Washington State University. Sorry. There is also a international IMS conference; it's held every year, one year in United States, the next year is somewhere the rest of the world, and sometimes we take–

Q. Let me ask you this about the conference.

A. Yes.

Q. Is that conference well-attended by people in the field?

A. Yes, yes.

Q. And have you personally attended these, the conferences?
A. Yes, I did. I attended last year; it was in Ottawa. This year it's in Switzerland, going there. The next year it's going to be in Boston, and we would be organizing the conference.
Q. Okay. And we have here on the PowerPoint, just for the record, a number of journals; the International Journal of Ion Mobility Spectrometry, you talked about the International Society of IMS conference. And analytical chemistry as a field, is that something where the IMS is also discussed or is that a journal?
A. Yes, analytical chemistry is really a field. There is also a journal called Analytical Chemistry. You can find papers that are published there that relates also to ion mobility spectrometry. But the two major one where you can find basically knowledge about ion mobility spectrometry are the two first one, International Journal of IMS and also International Society of IMS. That's basically the two major papers or journals.
Q. Okay. And we talked a little bit about the error rate for the ion scan machine and the nuisance alarm and the alarm rate. Tell me, is the ion scan generally accepted within the scientific community?
A. Yes, it is, it is accepted. In fact, in some applications, if it does not meet a certain criteria, the instrument is not deployed in the field. So we always try to make sure that we meet a very good detection performance as well as a false alarm.
False alarm is a very important parameters that any user has to

characterize and find out about the instrument, because you want to minimize that as much as you can. And we try always to basically make it close to zero.

Q. And has the ion scan technology been subjected to review by other people in your field? Has it been critically analyzed?

A. Yes, absolutely. The ion mobility spectrometry, in fact, has been analyzed by, especially if you look at, for instance, just TSA, TSA, although they were only focused on explosives. But we work with also other agencies to try to evaluate narcotics.

We have two trial, for instance, the next maybe in June or July, where some organizations can meet also in Europe. They want to characterize all of our device, check basically, if our instruments meet their criteria for narcotics detection.

Q. And say, with the TSA and airports, how many samples, for example, would they take?

A. Oh, TSA, I don't know, hundreds of thousands of samples. They are using our instrument maybe for more than ten years. They are deployed at many checkpoints in airports. They do have the record of basically– I don't know if they record the samples, but every alarm is recorded and stored. But it's tens of thousands of samples. I can't tell you the number.

Q. Okay. And it's used typically. When we talk about the TSA, just so that we can understand something that we've all used, is it the swab that they use over your luggage?

A. Yes, it's the swab they use. Yes, they have basically either

paper traps or Teflon traps, and they take the swab and they just swab it through any surface, luggage. And then they insert the swab into the device and a few second later they get the results.

Q. Now, if you could explain for the Court how the machine is actually used, please.

A. Okay. If you can click again, you go to next, and then next, and next, next– go back. Sorry. Okay. So this is the schematic of our detector, which is the ion trap mobility spectrometry. You will see here on the left hand side it says, "Inlet/sampling system." So this is where basically you insert your trap.

So the trap is inserted into this region, and this region is kept at a very high temperature. When you insert your trap–

MR. ELDRIDGE: I'm sorry. What?

MS. PLOWELL: Temperature.

A. Temperature. And when the trap is inserted into what we call the desorber, we vaporize all the molecules that are on the trap. Once evaporization process is complete, the molecules are then transferred into the ionization region, and you can see here what is the ionization region.

Q. Is that here, this second–

A. Yes. There is a box called "Ionization Region." Okay. So basically what we do there, we ionize the molecules, so the molecules get into that region. There is a radioactive source that ionize the molecules. Basically, what we do, we charge the molecules either positively or negatively. For the narcotics the

molecule are usually charged positively.

And then when the molecules are charged, we release them into the drift tube, and then you can see the drift tube, what we call here in the schematic, ionization– sorry– the drift region. So the molecule flies from just after the ionization chamber to the end of the drift region.

And we know that equal zero, is because we have to release this molecule into our drift region. Basically, how we do that, you just pulse, you do electrical pulse on the ions, and then the molecules will fly into the inside– sorry– the drift region, and when they reach the ion collector, they produce an electrical current, and that's what you see.

There is a display on the bottom of the screen, yes, you're right. That's what you see, basically. When the molecule hit, it's a Faraday cup; it's basically just a electrical plate, and when molecule that are charged with different current, they create a signal, and that's what you see on the bottom of the display.

So we know that equal zero, we know when they arrive to the collector. The time is displayed in the X-axis, and that's basically– and then if the molecule would show up to a time that we think is specific to a certain molecule, then we can attribute that's similar to the presence of certain molecule.

Q. Okay. And when you say the presence of certain molecule, for us that is the substance that we're looking for, the drug or the explosives?

A. Yes, yes. The system has been calibrated or characterized for a number of explosives and narcotics. For the device that has been used, I've looked at, there is about nine narcotics that are basically calibrated and also used in this device.

Q. Okay. Now, if you would explain for the Court, does this happen automatically when you put the trap in or is there something that the operator has to do to get this process to work?

A. Everything is happening automatically, so the operator, the only thing they need to do, is, basically, insert the trap into the desorber. The trigger button is automatic, all the rest, the analysis is automatic, the display of the results is automatic, everything.

So the operator has basically just to insert the trap. Depending on the results, if they have alarm or not, they have to clear sometimes the system. So they need just to push a button to clear the alarm; or if there is no alarm, the system is ready for the next analysis.

Q. Can you explain for the Court what you mean by an alarm?

A. Alarm is basically when we think a substance is detected, a substance that is in our substances list. So if there is a substance that is detected and it's above certain threshold and we think it's there, there is an alarm or a warning.

So basically you have a red warning that tells you that something has been detected.

Q. And, Dr. Boudries, if you could explain for the Court, specifically with regard to the cocaine and the ITMS, what is the

threshold, the minimum threshold?

A. This is– goes back to the previous question. So when we define the detection for certain substance, if we take the case of cocaine, for instance, when we go in the field we try to define what is the minimum alarm level to minimize all false alarm.

Alarm level is basically a level after which we are a hundred per cent confident that cocaine is detected. That's how we set the alarm level, and they are different from one substance to another. So if we– you have a sample and you try to analyze the sample and then the alarm or the signal is above the alarm level, then we are in the confidence to say, yes, this is cocaine that is detected; and then, of course, the results are displayed in the device.

So the alarm level are determined from the field data to give us that confidence that if a substance is detected we can actually view that to exactly that substance and minimize all false alarms.

Q. Okay. And does the operator of the machine have certain protocols that they must follow?

A. There is protocols when the operators, of course, buy the machine from us. We provide the machine with manuals, different kind of trainings. There is different level of operating the machines; there is from a basic to a superusers. But that's basically– every operator has his own mode of operation.

Q. And is the machine designed to protect against operator error?

A. Yes. What we try to do, basically, when you are running the device as an operator, if there is anything that is outside the normal

operation of the device. So what do I mean by normal operation of the device? Is basically for every analysis you have to– the system has to be set at certain temperatures, flows, voltages, et cetera.

So for every sample we go and check all these parameters. If one of these parameters is outside the optimum range, there is a warning. When the warning is displayed, basically, the instrument cannot be operated until the warning is resolved.

So this is how we can minimize that the operator make mistakes or especially around the device when it's not calibrated or it's not at its optimum conditions.

Q. And how, if you can explain for the Court, how does the machine calibrate itself?

A. So calibration is a very important part of running the device. We have recommendations to the operator on how they want to calibrate the device. It's automatically programmed in the system.

So, for instance, every eight hours there is a warning to inform the operator that they have to calibrate. If they don't calibrate, they cannot operate the device. And the supervisor can change that to four hours or two hours.

But if you have that, so you will get a warning so the instrument has to be calibrated. The calibrated has to be successful before you can go and operate the device.

Q. And if you can explain for the Court, how does the instrument report its results?

A. The instrument, basically, there is different way how you can

report the results. When we offer the instrument to our users, we try to give them from a simple report display to a very detailed report. And all that informations is anyhow saved, so even if you decide to display by just green or red, or you want to display times, time of flight, peaks, height, also other information.

So the simple display will be basically, if a substance is detected, the instrument will show green– sorry– a red alarm, it says something has been detected. Then you can go, look at exactly what you have, or you can select different mode of displays.

Q. Does the machine tell you what you have or is that something that the operator has to interpret, if you know?

A. It's also programmable. You can select the machine to tell you exactly what you have detected or you can turn that option off. But it's all, all saved into the file, so you can always go back and look at it.

Some of the users, they don't want to display the name of the substance for multiple reasons, so we give the options to the users to disable that option if they want to.

Q. And did you have the opportunity to review the results in this case?

A. Yes, I did. I looked at basically all the plasmagrams that were collected.

Q. And explain for the Court what the plasmagram is.

A. Plasmagram, if you look at here on the bottom of the screen,

that's the plasmagram. It's basically the results of the analysis. So you have in blue what we call the negative ions, and on the bottom is the positive ions. The positive ions is the region that is used basically for the detection of narcotics. The negative is merely used for the explosives. That's the plasmagram.

So what I've done is, I looked at all the plasmagram that were collected. I looked at two things; first, to see if the instrument was clean, if the instrument was calibrated, and if the peaks were really at their position. And so everything seems to me that was operated in the right conditions.

MS. PLOWELL: I have no further questions for this witness.

THE COURT: Doctor, how would a plasmagram look if you were detecting multiple explosives and multiple narcotics? Let's talk narcotics. If you were picking up cocaine, methamphetamine–

THE WITNESS: MDA?

THE COURT: Yeah, there you go, Ecstasy. When you've got all that on the single sample, would those different drugs be demonstrated on the plasmagram?

THE WITNESS: Yes. If you look at here, it's more or less the same thing as you can see here on the bottom of the display in red. So you have– if you have a mixture of narcotics, you will see different peaks in the plasmagrams. So they are all differentiated.

In the plasmagrams, when you print the results, it tells you basically where the positions of every narcotics should show up, and they are all– they all have their own specific windows where the different narcotics will show up.

And we have, within that window, we have also errors window, make sure that if the peak shift a little bit it's within that window, and all of them have their own specific time of flight. So there is a mixture you see multiple peaks in the plasmagrams.

THE COURT: Well, this particular illustration you have three peaks.

THE WITNESS: Yes.

THE COURT: That is demonstrating what?

THE WITNESS: Three peaks, for instance, demonstrating that there is the three different molecules in your system.

THE COURT: Three different molecules that the device was intended to detect?

THE WITNESS: To detect, yes.

THE COURT: So just for purposes of our discussion, these three peaks would demonstrate that it was picking up three molecules of what?

THE WITNESS: Oh, this is, first of all, this is just an illustration.

THE COURT: I understand.

THE WITNESS: Let's assume we have heroin, THC,

and cocaine, and I make a mixture that has three narcotics. So I insert the traps into the detector, what you will see in the plasmagram, you will see three different peaks in the plasmagram. One will show up exactly the time of flight for cocaine, the other one is THC, and the third one has heroin. So that's what you will see in the plasmagram.

THE COURT: And it is the peak, the height of the peak itself, that is of interest to you?

THE WITNESS: Yes. The peak has to be above a certain threshold, and that will give me confidence that that peak is detectible, that molecule is detected. So there is two things during the analysis that are very important; one is the time of flight. The peak has to show up at a certain time.

When the peak is there, it has to be above a certain threshold. So there's two things that are important, the time of flight at first. When we found the peak, we look at what is the peak height or the intensity of the peak, and it has to be above a certain threshold. And it's only when these two conditions are met then would trigger alarm.

MS. PLOWELL: Judge, if I could switch over to the presentation, I can actually show you an actual plasmagram that was used that might be more useful to you.

THE COURT: Okay.

MS. PLOWELL: Do I just press this button?

Q. Okay. Dr. Boudries, do you recognize this?

A. Yes, I do.

Q. And what do you recognize this as?

A. Okay. I can start with the plasmagram in the bottom. This is a typical display of Itemiser-3 plasmagram results. What you will see always on the top is the negative display, and then the bottom is the positive. This is where we look at the– then the narcotics.

On the left hand side there is some numbers there. We also display the time position and also the big height corresponding to every time. So the left column is the explosives, and then the column just to the right of it is the narcotics.

For every plasmagram that is taken, everything that was used to collect that sample is also stored with the sample. For instance, the date, the calibration files, the temperature, pressure, calibration offset, the cal. factors. So these are also parameters that I can go and look and make sure that the instrument was operated in the right condition.

So not only the results are displayed, but also all informations about how the instrument was operated are also saved and displayed with every file.

And then you can see it here on the right hand side, you see the– sorry– it says notes, file name– every file is saved– the date, the time, the software version, how– the mode of operations. We have a dual mode, or a negative or positive; and everything else, temperatures, flow are saved.

And then if you go a little bit to the right side, so here you see

the list of substances that are basically used in our device. The top ones are the explosives, the bottom ones are narcotics. The second one, the second column, is the standard location.

When we calibrate the device, the software will go automatically to the standard location, look for the presence of a peak. If it found a peak, it goes to the threshold column, which is basically the last one, and you look.

If the intensity of that peak is above a certain value, it is only when it's above the threshold and within that specific time of flight that the alarm is triggered.

Q. And the one that we're looking at, is this a blank trap?

A. If you go back to the– no, this is cocaine. You can see here that cocaine is detected. And if you look at on the left side, it's that there is cocaine-plus, and it gives you the time of flight and also the intensity of the peak.

The intensity of the peak here is determined as a ratio between the peak height and also the threshold. It tells you that the cocaine here is 2.5 times higher than the threshold value. By the threshold value, we think that anything below that, we don't attribute that to cocaine.

Q. Okay. Very good. And if you'll look at the first, the top one here, if you can explain that one as well.

A. The top one here, it shows a big signal of cocaine. And what is important, if you compare the top one to the bottom one,– if you just go back to the bottom one, again, little bit more. So if you look

at the bottom plasmagrams, you can see cocaine peak, and then there is another peak just before, four milliseconds. That's the dopant peak. That's the ammonia that is used basically to suppress all the other molecules.

And the top one, there is only cocaine peak present. Why is the other one has disappeared, because what's happening is when cocaine is injected into the device, cocaine react with the dopant–

(Court reporter asked witness to repeat.)

A. The dopant, d-o-p-a-n-t, dopant, and it's ammonia.

Basically, when you have high concentrations of narcotics, they react with dopant. If the concentration is very high, the dopant is depleted, and that's what we see in the first plasmagram, it's completely depleted. So this is why you have high concentrations of cocaine. It means that the top sample has the higher concentrations than the one on the bottom.

MS. PLOWELL: Very good. And, your Honor, I'll offer this as Government's Two.

(Government's Exhibit No. 2 received.)

MS. PLOWELL: Okay. Now I have no further questions.

THE COURT: Why don't we take about a ten-minute break?

MS. PLOWELL: Okay.

(Recess had at 10:41 a.m.; Court reconvened at 10:56 a.m.)

THE COURT: Doctor, one quick question. The name

of your device, is it Ioniser or Atomizer?

THE WITNESS: Itemiser, I-t-e-m-e-s-i-e-r (sic), dash-3.

THE COURT: Goodness. I-t-e-m-e-s-e-r?

THE WITNESS: M-i-s-e-r, yes. It's written here on the display on the top left hand side. It's little bit difficult to read, but it's I-t-e-m-i-s-e-r.

THE COURT: The Itemiser-3. All right. Mr. Eldridge?

MR. ELDRIDGE: Thank you, your Honor.

CROSS-EXAMINATION

by Mr. Eldridge:

Q. Dr. Boudries, if I may, I will tell you that I have in my hand what was introduced as Exhibit Number Two, and I want to ask you some very specific questions about that; okay? I'm over in the left hand, upper left hand corner. Does that look like the upper left hand corner?

A. Yes.

Q. Okay. It would appear there is the name up there in the upper left hand corner, "GE Itemiser-3." Now, that's the machine made by your company?

A. Yes, sir.

Q. Okay. And it says, "Drugs Detected," and then on the left hand side it says, "Substance Cocaine+," and then there's a list of negative– are those negative ion time? Is that what that means?

A. Yes, negative ions. And then on the bottom is time. It tells you the time, the time of flight of every peak that is on the plasmagram on the top side.

Q. Okay.

A. And then the left column is positive ion time, and then the– there is height. So for every time, for every peak that is detected, we display the time in milliseconds and the height of the peak.

Q. And what's confusing to me is, you look over to the graph as it's displayed here, and I don't see but one peak. But yet on the left hand side it says there are many peaks. Can you explain that?

A. I am not sure to understand exactly your question, but–

Q. Okay. Let me ask.

A. Yeah.

Q. I can ask a better question.

A. Yes.

Q. If you look at this information here–

A. Yes.

Q. –is that the information that is here?

A. Yes, sir.

Q. Okay. Now, is this showing cocaine?

A. No. The cocaine would never show up on the top. This is the negative ions. This is all molecules that are charged negatively. Cocaine is a molecule that is charged positively and will show up only on the positive display.

Q. Okay. Only–

A. So the top one–

Q. –only down here?

A. Yes.

THE COURT: Well, just for my edification, what is showing up up there on the negative ion scale?

THE WITNESS: Oh, it could be anything. This is peaks that are– for instance, if you take a sample and then there is dust, sand, oil, sometimes you see the small peaks here. That could be almost anything, background, what we call just a background chemicals that are collected.

Because when you collect the trap, when you have a trap and you try to take a sample, so you try to get your sample, but at the same time everything with the sample, such as dust, assuming that you are just sampling from the top of a desk, that also be introduced in the sample. Sometimes you see that in the device.

By Mr. Eldridge (continued):

Q. Okay. Now, I'm going to go to the right hand side of the exhibit, see if I can get that all in there, perfect, just barely fit. At the top, on the left, it says, "Notes: Don Reynolds #6," correct?

A. Yes.

Q. I assume that means this is the sixth sample that has been run on Don Reynolds?

A. This one is entered by the operator, so the best person to answer to these questions is the one who entered this. This is not generated automatically by the machine; it is a note that are typed

by the person who is taking sample. We offer that option to the users, if they want to write something. So it is going to be always captured when you take a sample.

Q. Okay. Now, and then it has a list of substances for which the machine is testing; am I correct?

A. Yes, you are correct.

Q. Now, is every Itemiser programmed for these particular substances?

A. That is– we have different configurations, depending on software versions. So some users want to have maybe another substance added, some user wants to have one substance removed. So I don't know on the top of my head every software version.

Here what you are looking at is a software version 8.15, and on the right hand side is the substances configuration for that specific software version. So you have the top ones are the explosives and the bottom ones are the narcotics.

Q. Okay. And there's– okay. And then, to follow this on out, for example, it says, "TNT," and then it's got standard and calibration, and there seems to be a number there. What is that number?

A. Okay. So this number here, so your first column is the standard location, so this is where–

Q. What?

A. Standard location. This is where we expect to see the peak. The next one is the "Cal" value. "Cal" value, basically, we have two ways to display the results. It can be displayed directly in

milliseconds or it can be displayed– sorry– displayed in calibrated unit, and that's basically is just a calculation going from standard locations to a calibrated value. It's just the same ratio going from both columns. They're more or less the same.

The next two columns are the window. When a peak– for instance, if you look at TNT, the standard location is 6.070. So the software automatically goes to that location, and then it will look at what is the signal coming from the instrument at the time of 6.070 milliseconds, and it will look everything that's there around 6.070, plus or minus 0.40 milliseconds.

That's the window we are looking at for the TNT. So that's basically your windows for every substance– sorry– for every substance in the instrument. And then the next column is the alarm level. So when a peak is detected at that standard location and still within that window, we check if the peak intensity is above the alarm threshold, and if it's only above that level the alarm is triggered.

Q. And so for the first six or eight– six, seven substances, this particular test run through the Itemiser was negative; am I correct? Is that what "Mode" means?

A. No. The mode is the– if you'll go back to– sorry– the last slide of where you have the plasmagram, so the top one we call the negative mode and the bottom one is the positive mode. The positive and negative was referring to basically if the molecule is ionized as positively or negatively. That's what "mode" means.

The narcotics are positive mode and most of the explosives are negative mode. It's basically– if you have cocaine, when you ionize the cocaine, we remove an electron from the cocaine. That's how it becomes positively charged. When you have explosives, an electron is added to that molecules; that's how it becomes negatively charged.

This is basically almost mainly for us and help us, when we write the software, to where to go and look for the presence of the peak. It's really– that's only information you can get from that.

Q. I guess my question is, if you look on the far right side, under "Mode," you see negative and positive. This particular sample, as you've said, was positive for cocaine, but is it also saying it's positive for heroin?

A. No. These modes here has nothing to do with the results.

Q. Okay.

A. These modes are the– it really refers to how the molecule is charged in the ionization chamber. It has nothing to do if it's positively detected or negatively detected.

Q. I understand.

A. So I know it's little bit misleading.

Q. I understand. But continuing, if you go down to cocaine on that list and you – what you're telling me is this machine is calibrated so that it looks for 8.566?

A. Yes.

Q. And when it senses that peak an alarm is given inside the

machine, right?

A. Yes. It looks really at the position of at 7.936. If the peak intensity is above the threshold value– in this case it's 750– the alarm is displayed.

Q. Plus or minus that .040?

A. Plus or minus .040, that goes to the time.

Q. So what other substances would be within that plus or minus .40 for cocaine?

A. There is– if you look at hear on our substances list, there is nothing else that will show up even near that cocaine window.

Q. On this list. But what about in the universe?

A. In the universe, there is always a probability that something will show up. But as I explained it before, the instrument, when we build it, we test it with thousands of samples, random samples, that are taken, airports, buildings, anything, just to minimize that false alarm, that not any substance would alarm.

And that's where the 750 comes in. So we make sure that when we put that 750– because the instrument, in fact, can detect cocaine even lower than 750. So we put that by just to make sure that nothing else will just generate a cocaine response.

So that's where the 750 comes in. And then if we have a signal that is above that value, then we have a very high confidence that it's cocaine and nothing else.

THE COURT: 750 what?

THE WITNESS: A unit. It's basically what we

measure, is the current of the signal in the detector. So If you go back to– sorry– the left side here of the plasmagram, if you look at the Y-axis, you see from zero to 12,000. This is 750 units. It's basically microamps.

THE COURT: Excuse me. So to a certain extent then you are measuring quantity to the extent you're measuring a concentration?

THE WITNESS: We are measuring, we can quantitate this device. In fact, this device is used in pharmaceutical application exactly the same where they quantify. But we just decided to make the use of it very simple. We don't require the people to do quantitative calibration. That's the only thing that's implemented.

THE COURT: So the machine is set at a level that has got to be this concentration before it triggers?

THE WITNESS: Yes.

THE COURT: Before it gives an alarm?

THE WITNESS: Yes, sir.

THE COURT: And I'm sorry, Mr. Eldridge, but I'm trying to keep up with this. I don't mean to walk on you here.

MR. ELDRIDGE: I think you're helping us, your Honor. Thank you.

THE COURT: On the graph, the peak, the height of the peak, that peak is measuring what?

THE WITNESS: Is basically when the ions or the

molecules travel in the drift tube, they are charged, if you take cocaine or narcotics, they are charged positively.

THE COURT: Right.

THE WITNESS: So when they hit the Faraday cup, they create a current, and what you see is, they produce a current in our device. So there is a background when there is nothing. The molecules arrive to the detector and they create a current, and That's what makes what– the peak is generated.

THE COURT: Okay. So it's measuring the amount of current?

THE WITNESS: Measuring amount of current that are created by the molecules when they hit the Faraday cup.

THE COURT: Will THC, a molecule of THC, generate a different amount of current?

THE WITNESS: They generate different amount of current, and that amount of current is proportional to the amount of THC, but it will generate it at the same time of flight where you see THC.

THE COURT: You anticipated my next question.

THE WITNESS: Okay.

THE COURT: For a particular substance to be identified as THC, cocaine, methamphetamine, whatever, there has to be a known correlation between the peak and its timing?

THE WITNESS: Yes, absolutely, you're absolutely right. And that's exactly what we see here in this display. There is

two important things, the time, the standard is a time. These numbers here, there's no unit, but this is the time when you see 6.070 and 6.070 millisecond. So the time gives you the identifications of the molecule, and then the peak height give you the intensity of that molecule.

THE COURT: What?

THE WITNESS: Intensity of level.

MR. WEDDLE: Intensity.

THE WITNESS: Intensity, sorry. Excuse my– intensity, i-n-t-e-n-s-i-t-y, intensity.

MR. ELDRIDGE: Intensity.

THE COURT: Oh, intensity. Sorry. You've got me off, so have to remember we're all East Tennessee here.

THE WITNESS: Sorry. So it's two things; you would do identification and then quantification. So the times give you the qualitative information and the alarm or the peak height give you the quantitative information.

By Mr. Eldridge (continued):

Q. Dr. Boudries, is it possible, after you ran this sample, to do a blank sample and still the machine would show cocaine?

A. Yes. But there is a protocol that is well-defined when you use our machine. When an alarm is triggered, you have to clear the unit. You cannot just sample automatically after that. Means that there is a protocol that you have to go through to clear the unit. It means that unit has to go automatically to a ready mode.

Ready mode means that there is nothing left in the device before the unit is ready to accept another sample. So if you follow that protocol, the probability that you have something left from the previous sample is almost zero.

Q. And you have looked at the plasmagrams and the results of the plasmagrams done in this case?

A. Yes, I did. And I even asked that specific questions, and I was told that after every sample you have to clear it, you cannot do anything else unless you clear the device; and even after that a blank was run. That means that a blank trap was inserted into the device. Then you are guaranteed that there is nothing left into the device. So that was done, to my knowledge, during this analysis.

Q. When the blank was run, did it ever show up for cocaine?

A. I did not look at the plasmagrams, but I was told that the blank were clear. And if an alarm, a blank is done, an alarm was displayed, so you cannot do another sample unless you clear the device.

Q. Do we have a plasmagram for the blank?

A. I do not have plasmagrams for blanks.

Q. Okay. Now, Dr. Boudries, as you've told us, you are an employee of General Electric. How long have you worked for them?

A. Four years.

Q. And is one of your tasks to promote and sell these Itemisers?

A. No. My task is merely research and development. I basically

work on just the detection of the device. I'm not involved in selling the device or promoting the device. I'm merely focused on improving the technology, make it more robust, more sensitive, and also understanding the requirement of the customer.

Q. In your professional history, which has been provided to me, you indicate that some of your responsibilities include "Sustaining our commercial products;" am I correct?

A. Yes, you are correct.

Q. And one of those products that you are sustaining is the Itemiser-3, correct?

A. Yes, you are right.

Q. And by sustaining, that means that you want to make sure it stays on the market, right?

A. Yes, absolutely.

Q. So in that sense you are promoting the Itemiser-3, correct?

A. I am not sure to understand exactly your question, but I am working hard to make our– all of our product be accepted by every users or new users in the market. So I try to make sure and understand what the customers want and try to translate that to detection performance and implement that in our instruments.

Q. Okay. The particular device that was used in this case is, in fact, an Itemiser-3?

A. Yes, it is, and it is displayed also in the plasmagram. The name of every product is displayed on each plasmagram.

Q. And as you said, it is a desk top device?

A. Yes, it is a desk top device.
Q. Do you know the history of that particular machine?
A. To be honest with you, I don't know when the machine was built. I think it's– when I joined GE in 2005, the instrument was already commercialized. But I don't know exactly. We have Itemiser-2's; that is the first generation; Itemiser-3 is the next generation, and we have right now the Itemiser-DX, which is the new generation of desk top device. But I don't know when was the Itemiser-2 released to the market.
Q. And the DX, of course, would be better than the Itemiser-3?
A. The new, of course, we always try to improve the detection performance of all of our product.
Q. And it would be more accurate?
A. I would say more sensitive. The accuracy is the same because all devices uses the same detector. It's just to improve the sensitivity of the device.
Q. Dr. Boudries, you indicated that the machine has been certified. What did you mean by that? Who certifies the machine?
A. The Itemiser-DX was certified by TSA, Transportation Security Administration.
Q. I'm talking about the Itemiser-3. When you say certified–
A. Oh, it was certified by European agency called ENAC, E-n-a-c. the Itemiser-2 was certified by TSA and the Itemiser-3, the same one that has been used here, was certified by ENAC.
Q. What's ENAC?

A. I can't remember exactly the– it's the equivalent of TSA in Italy.

Q. So there isn't a world-wide certification process, is there?

A. Yes, there is.

Q. There is?

A. Yes.

Q. So none of these machines were certified by a world-wide certifier; am I correct?

A. We try to– basically, every country, they have their own requirements for every device. So what we try to do, we try to deploy our device to every agency and get it certified. There is no one certification for the entire plant. Every country has its own. So that's what you try to do, we try to certify all product in almost every country.

Q. So what you did with TSA was to give TSA a number of these machines?

A. Yes. There is a well-defined protocol that we have to follow. It's published by TSA for every, basically, vendor. And you have to provide them with the unit and they just test it.

Q. So you give them a bunch of these machines hoping that they will then endorse your product and buy it?

A. No. The TSA– sorry. It's the TSL. This is the organization that certified the product; they don't buy product. Their main function is to certify the product. They only look at the detection performance of the device. The agency who make the decisions to

buy are completely different.

So there is a lab, a governmental lab. Their main functions are to evaluate the performance of the device. The people who make the decisions are completely different. They just want to know is this instrument certified, yes or not.

Q. And when you say that you sent your machines to be analyzed by the government, what did the government say was wrong with these machines? What criticisms did they have?

A. First of all, the government don't tell us what's wrong. There is a few things they can share with us, and some of the information I cannot share with you or we just know that if it doesn't meet the requirement it cannot be certified. So there is something they can ask us, oh, can you please modify this, can you add this feature, we would like you to do this.

But the detection performance, if you don't meet the detection performance, the instrument is not certified. And the results of the certification are classified. I cannot share them with you.

Q. So make sure I understand, going back to your Exhibit Two, when this plasmagram says there's cocaine, it's not measuring how much cocaine, is it?

A. Well, if you look at the second column, you see the time, 7.857, and you see the height is 5381. Five thousand three hundred eighty-one, that's your peak, peak height. And if you look at the top, it says cocaine, it gives you the time and it gives you the strength.

The strength, basically, it's almost a ratio between– there is other factor that are taken into account calculate the strength. It gives you how intense is the peak so you have some informations about the strength of your cocaine detection. And it's displayed on the right side of the plasmagram.

Q. My question is, what does that mean? I mean, it says, "Strength, 1.02," but how does that translate?

A. Basically, that all translates to the detection of the cocaine. As I said, there is a certain level which is, in this case, for instance, 750. If there is a peak at that specific location that can be attributed to the cocaine, we try to see how strong is that peak. And that's then the value that is displayed there, is the ratio between what we think is the background of the cocaine at time of flight to the intensity of the peak that you just analyzed during that sample.

So that's the strength. But the peak height, it's also a good indication of the intensity of the peak. So the peak height here is 5,381 and the threshold is around 750, which is almost seven times higher.

Q. You indicated that the Itemiser is not as good or this particular technology is not as good as the gas chromatograph; am I right?

A. I did not say it is not as good. They are completely two different devices, they have different applications. They are designed differently. In fact, the ion mobility spectrometer is

extremely sensitive device, and it's very simple. But I don't think we can attribute the word "are not as good as."

Q. Well, can you do this kind of test on a GCMS?

A. Oh, absolutely. I think you can find many different techniques that you can use or you can develop to analyze narcotics. I'm sure that there is, yes.

Q. In your direct examination you talked a little bit about operator error and calibration, and you've told us that the supervisor can change the time of calibration to a shorter window than eight hours; is that correct?

A. Yes, they can, yes.

Q. Can they increase the time?

A. I can't remember. I don't think that they can. I think the option in the software is four hours and eight hours, but I don't think we have something that is above eight hours.

Q. And you say the machine calibrates itself?

A. Yes. There is an auto-calibration mode. When you are– excuse me– when you are in operator mode, there is a button called "auto-cal," and the only thing the user has to do is just insert the calibration traps and that's it.

Q. So you're actually running another plasmagram–

A. Yes. Yes, sir.

Q. –to calibrate?

A. Yes.

Q. You have indicated that this ion mobility spec–

A. Spectrometry.

Q. –thank you –spectrometry has a two per cent error rate. Did you tell us that?

A. Yes. Less than two per cent.

Q. How is that determined?

A. It's basically these are the– when we built the unit, we go in the field, we take several thousands of samples, and we try to characterize the detection parameters so that the false alarms will not generate a number that is above two per cent. So that's how we determine that.

So, basically, as I said, we take thousands of sample on almost everything we can, and we can always process data. Every data we take we can get it in our database and just run it if we think it's a blank.

Q. When you say 7,000 samples, is that 7,000 samples of things that you know what it is?

A. We don't necessarily need to know where it is. We can just go in a room like this and take thousands of sample, almost every corner. We go outside, we go in a car, buildings, airports, bags. We try to sample as much as we can, almost everything. And then we add all of that in our database. That represents our background level and that's how we determined that 750. We can say we analyzed almost everything we can get of, and then we think if we are below 750, nothing would alarm on cocaine.

So if we see something above that threshold then we can

attribute that level to, for instance, cocaine, or any other substance.

Q. What I'm asking is, when you say you take all these samples, you're not testing it against a known quantity, are you? You're just taking samples?

A. Yes.

Q. How can you use 7,000 samples of things that you don't know what they are to tell you what kind of error rate it has?

A. It does not really matter because what you are looking at is interferent, so it can be anything. I don't need to know exactly what I have on the sample. I just want to know if anything that is on the trap is going to show up exactly as the time of flight of cocaine. That's the information I'm looking at.

I don't need to know what's on the trap. I just want to know, if there is anything there, is it going to show up at the same time of flight as cocaine. So we don't need to know what's on the trap. In fact, you want just to analyze, insert the trap into the device.

Q. So how do you get a false positive?

A. So basically all of this, if we– for instance, if you do the blank analysis and one of them will give you a big height above that, what we think, 750, that we have designed; that's a false positive. So we take first all these blank samples, we analyze all of them, we go and look.

All of them, what is their response at the specific time where we expect to see cocaine? That's where we put that threshold. So and then we can say we think that only two per cent or less are

going maybe to give us either a false positive or a false negative.

Q. What I'm asking is, what causes it?

A. Oh, it can be anything. It could be another molecule, it could be somehow another molecule that is injected into the device that has a similar drift time in our device that would show up somehow at the same time as cocaine and will just pop up there. That's– it could be anything.

Q. Does the operator require any training?

A. Yes, it does.

Q. What training does the operator–

A. Oh, we offer different trainings. There is operator training, supervisor, superuser, advanced training. And I think people, when they buy our instrument, so they offer them the package and they have to select what they want to do.

Q. Do you know what the operator in this case had?

A. No, I don't know.

Q. Are you aware of some problems that have been generated from this machine?

A. Can you please specify what you mean by problems?

Q. Well, for example, I have heard that, if you look at currency, you'll find trace amounts of cocaine on currency; is that right?

A. Yeah, you're absolutely right.

Q. So if I handle currency and somebody swabbed my hand, there is a probability, to use your word, that this Itemiser would say that I had cocaine on my hand?

A. You are absolutely right. If you sample currency directly, there is a chance that you would see some narcotics. I don't think that if you sample your hands you will find cocaine. It's only if the currency really had a huge amount of particles from cocaines or any other narcotics, then maybe by doing a double transfer you can find cocaine in your hands. So, yes, there is a probability you find cocaine.

Q. Have you heard of problems that– well, this machine is used by prison authorities, isn't it?

A. Yes, you are right.

Q. And there's been some publicity about false alarms from these prisons, correct?

A. Yes, you're correct.

Q. Can you tell us– and, in fact, the Federal Bureau of Prisons has discontinued the use; have they not?

A. Yes. They did not discontinue to use. What they found out, what's happened, is that some of the hand sanitizers generated THC false alarms. That was not– the hand sanitizer coming right now in use. And what we have done, in fact, we developed filters, basically, to remove all alarms that are caused by hand sanitizer.

Thus, what's happened is that, when they saw that there is false alarm that is caused by just people going to prison for visiting, so we developed a filter in effect to remove all interferent coming from hand sanitizers.

Q. And have you heard that these alarms are generating false

positives on cocaine from–

A. No, not on cocaine. They were generating false alarms on THC and heroin.

Q. Now, this drift time that you spoke of, that can be affected by atmospheric pressure, can't it?

A. Yes, it can.

Q. And so if there's inclement weather, that could affect the drift time and affect the reading on the machine, correct?

A. Yes, it can, if the instrument is not calibrated. The calibration is function of temperature and pressure.

Q. And even if you moved it a few hundred feet in elevation, that would affect it?

A. Yes.

Q. All right. These systems have what might be called a chemical module in them, correct?

A. Chemical model? What do you mean?

A. Well, do you have to replace parts of the machines periodically?

A. Yes, sir. Some– the dopants, for instance, you have to replace them every four months for the ammonia and about eight to 12 months for dichloromethane.

Q. And would that have to be done on the machine that was used in this case?

A. Yes, all of our machines.

Q. And is that an expensive proposition?

A. To be honest with you, I don't know exactly what's the cost of the buying dopants and ammonia from our company.

Q. What happens if they're not replaced?

A. The instrument will not work, so you will have a hard time to calibrate, you would have a lot of false alarms and basically almost the instrument would be useless because you won't be even able to calibrate your units. So if the unit is not calibrated, you cannot do any, any sample.

Q. And the way you tell if the machine is calibrated is the machine tells you it's calibrated?

A. Yes. The machine tells you it's calibrated, yes.

Q. So you punch a button and say "calibrate," and it does it and then tells you it's done it?

A. Yes.

Q. And if there's something wrong with the way it calibrates, that's just the way it is?

A. Not necessarily true, because if you look at here on the plasmagram that you just have– if you go to the right side. So what you see here is that if someone miscalibrated the device, I could figure out that very quickly. So not only the parameters, the response of the system, is displayed, but also how the instrument is run.

So I can look at what we have here and I can find out exactly if the unit was calibrated or not. So that's one thing. So there is two lines here that are very important; it's called "N-Cal" and "P-

Cal" on the bottom. You can see it here where there is the arrow. That's a very important number.

If someone has miscalibrated, I can tell you very quickly if there was a miscalibration. That's one thing. If you go back to the plasmagram, I can also speak a little bit. Here, when I looked at the plasmagrams this morning or also yesterday, the first thing I want to look at is the dopant position. Usually if the instrument has been miscalibrated or the instrument was not running at its optimum condition, you would see a shift in the dopant position in both the positive and negative mode or sometimes you see that the peak intensity is not very high, and it was not the case.

So that was the first thing I checked when I looked at the plasmagram, is just to insure that the instrument was operating and running in its proper condition. So– and it was, and if it wasn't, I can look at just the plasmagram and I can tell you that there was something wrong with it.

Q. You said, from what we're looking at on the screen, you indicated you can tell the dopant?

A. Yes. The dopant positions, yes.

Q. Where is that?

A. You see on the left column, the first peak, 3.211?

Q. Yes.

A. That's the dopant position for dichloromethane. So it tells me that is in the right position, that there is no water vapor in the system, everything is dry. And then also I looked at the other

plasmagram with the positive. I just checked what was the ammonia dopant position, and it was also on the right time.

So I basically did just a check to make sure that all the temperature flows, the cal-factors, dopant position, all seemed reasonable and good, and they were all, in my opinion, on the right position.

Q. So the dopant position is the left hand column and the peak height is the right hand column?

A. Yeah. The dopant position, the first column, the first number, 3.211; that's our dopant.

Q. What does the number under it mean?

A. Three-point-two-one-one, and you see here, is one point–1382, that's the peak height.

Q. No. I'm sorry. The number under 3.211, what does that mean?

A. Oh, these are all the peaks that are on the plasmagrams. See, you see there is many peaks on the plasmagrams on the top. The first one is our dopant, is our dopant position.

Q. The others are peaks?

A. The other peaks that can just come from the sample. And if you look at the blank position, I think there was one plasmagram that I looked at, you can see these peaks are very nice, very sharp, on the right time of flight, and the intensity was very big. And the reason here they are small is because they are reacting with other substance, which means when there is other chemical they react, there is a chemical reaction also in our device. That's why they are

small.

And also I would just want to say something. When the calibration was performed, I was told that the verification was also performed. Basically, when you do a calibration, the calibration does what it does, is calibrate your time of flight. That's the only thing the calibration does in our device.

It means that you calibrate it and then we know if something will show up at six milliseconds is TNT. And then I was told that even after the calibration was performed, they did a verification. Means, assuming that the calibration was performed correctly, you verify by injecting other chemicals.

The other ones they injected was RDX and ephedrine, and in every case they detected RDX and ephedrine, which is the confirmations that all the calibrations were performed correctly.

MR. ELDRIDGE: Thank you, doctor.

MS. PLOWELL: We have nothing further, your Honor.

THE COURT: Fascinating. Thank you.

THE WITNESS: You're welcome. Thank you.

(Witness excused.)

C E R T I F I C A T I O N

I certify that the foregoing is an accurate transcript of the record of proceedings in the titled matter.

/s/*Donnetta Kocuba* 1/16/10

Donnetta Kocuba, RPR-RMR
Official Court Reporter
U.S. District Court
Knoxville, Tennessee